SELECTION OF A BEEF CATTLE SYSTEM FOR AN INDIVIDUAL FARM

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B. S., Kansas State College
of Agriculture and Applied Science, 1931

A THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Economics and Sociology

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

1948

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INTRODUCTION

The cattle population of the world is not distributed according to the number of humans; therefore, it is natural that countries having a small number of cattle per capita should obtain a considerable quantity of beef from nations that have a surplus. Great Britain, because of her leading position as a manufacturing nation and because of her small area and isolated position, was the first country to become alarmed over her constantly decreasing meat supply. As a result, she built up a large trade with exporting nations. This trade in its earliest stage was based on shipments of live animals and later, as the refrigeration industry developed, on dressed meat. In 1880 England depended almost wholly upon the United States to supply her with the beef which she herself could not produce. However, by 1914 with the advance of mechanical refrigeration, England secured the major part of her beef from South America. Today, approximately 50 percent of the beef used by the United Kingdom is obtained from the South American continent. At the same time that South American trade with Great Britain was increasing, the same set of factors caused an increase in the trade between Australia and Great Britian. During that period, the United States had changed from a nation that exported beef to a nation that provided only a little more beef than its population consumed.

For example, in 1900 the United States exported 1,380,000,000 pounds of beef and imported 1,500,000 pounds; whereas by 1940, exports had dropped to 220,800,000 pounds and imports had increased to 173,600,000 pounds, indicating the change from an exporting nation to a nation that produced only slightly more meat than it consumed. It is true that in the years following 1940, the

war years, exports again greatly increased. However, in 1943 the peak year, much of the 2,144,700,000 pounds exported was at the sacrifice of the meat consuming population at home and could not be considered a normal trend. It appears probable that in the future the heavily populated countries will be dependent upon South American and Australia for their beef, since the meat industry within the United States has become more and more a program for producing only enough beef for domestic consumption.

In light of this knowledge, a review will be given of the beef industry within the boundaries of our own nation. Here from the earliest times, the center of beef population shifted to the westward ahead of the influx of settlers. Texas was admitted to the union in 1845 and settlers moved to that state where they were successful in reducing to a state of semi-domestication the descendents of the cattle brought over by the Spanish Missionaries. Following the Civil War, choice steers were selling in the north for nearly $100 per head, and these cattle could be bought for between $3 and $6 per head in Texas. In 1866, the first drove of cattle came up the trail from Texas toward Abilene. During the following years, the centers of cattle population tended to be stabilized into two great general areas. One area, the southwest area, which included a large part of Kansas, Oklahoma, Texas, New Mexico, and Arizona, was the breeding or producing section of the United States. This section of the nation was characterized by cheap land, good native pasture, relatively moderate winters, and large operating units. Here, the keeping of cow herds and the production of stocker and feeder calves or stocker and feeder yearlings flourished. It was in this area in general, with the possible addition of the sand hills country of Nebraska, that most of the feeder cattle for the corn belt feed lots has been produced. The other general area, where there was a

concentration of cattle numbers, was the corn belt, comprising the states of Iowa, Indiana, Illinois, parts of Nebraska, Missouri, South Dakota, and Minnesota. It was in this general area that finished beef was produced.

The role of Kansas in beef production has been a very important one, since the state ranks third in cattle numbers after Texas, which generally ranks first, and Iowa, which normally ranks second. The state is in an intermediate position between the stocker and feeder producing area of the Southwest and the strictly full feeding areas of the Corn Belt. Because of this fact, emphasis in beef production in this state has been placed on developing programs that are intermediate between the production of stocker and feeder cattle produced in the Southwest and the production of prime full fed beef produced in the Corn Belt. Kansas has a combination of factors which are not to be found either in the southwest stocker and feeder area, or in the Corn Belt feeding area. This combination of factors includes the production of a great quantity of grass, a small amount of feed grain, and a large amount of rough feed in the form of silage and bundle feed. As a result of these factors, beef programs which are specifically adapted to Kansas conditions, have been developed. The purpose of this study is to divide the state of Kansas into areas of similar programs of beef production, to list beef programs best adapted to those specific areas, and to develop a method whereby a farmer or stockman can select the individual beef program that best fits the farm under consideration.

MATERIAL AND METHOD

Beef programs, to be successful, depend on two different types of material; namely, production information and marketing information. Production inform-

tion contained in this study consists of the results of experimental studies at Kansas State College and demonstrations conducted by the Extension Service in the field. Included in this material are rations fed, production methods, and gains to be expected under the various programs.

Since the profit or loss of a particular cattle program depends not only on production methods and efficiencies but also on seasonal market trends for particular grades of cattle, market trends must also be taken into account in selecting systems.

Stocker and Feeder Cattle

For both good to choice and common to medium stocker and feeder steers, the low point in the seasonal price variation is in the fall. This is the result of heavy grass runs of cattle from the range areas where larger numbers of cattle can be summered than can be wintered. Inversely, the seasonal high price occurs in the spring when that same range area is in the market to buy back cattle to fill their pastures.

Slaughter Cattle

Good and choice slaughter cattle reach their peak in the fall. This is brought about by the fact that at that period cattle on the market are, for the most part, grass fat cattle with only a very limited run of grain fat cattle. The low occurs in the spring at which time the Corn Belt unloads its feed lots. Cattle feeding is normally based around a plan which calls for the pur-

chase of cattle in the fall, when most crop work is done, feeding them all winter, and selling them in the spring ahead of farm work.

Medium-to-common slaughter cattle have a price trend that is almost the reverse of the better grades. During the spring, good to choice slaughter cattle are depressed because of large runs of long fed cattle. At this time the spread between good to choice slaughter cattle and medium to common cattle is narrowest. The low for this class of cattle is in the fall when many grass fat cattle grading in this bracket are on the market. Thus, a winter feeding operation in Kansas, where usually there is an abundance of rough feed with a limited amount of grain, would best adapt itself to the use of the lower grades of cattle.

There are two systems recommended for Kansas which produce good to choice slaughter cattle in the fall at their seasonal price peak. These programs are the creep feeding of calves and the deferred feeding of steers. Figures 1 and 2 show that good to choice slaughter cattle reach their price peak in the fall; therefore, these two systems are best adapted to the production of this type of cattle when they can be marketed to the best advantage. The deferred program also has an additional advantage on the buying end. It calls for buying choice stocker and feeder calves in the fall at their low point, handling them for a year, and selling them as good to choice slaughter cattle at the seasonal high. Good production methods, coupled with the advantages this program enjoys from a marketing standpoint, make it a very profitable one.

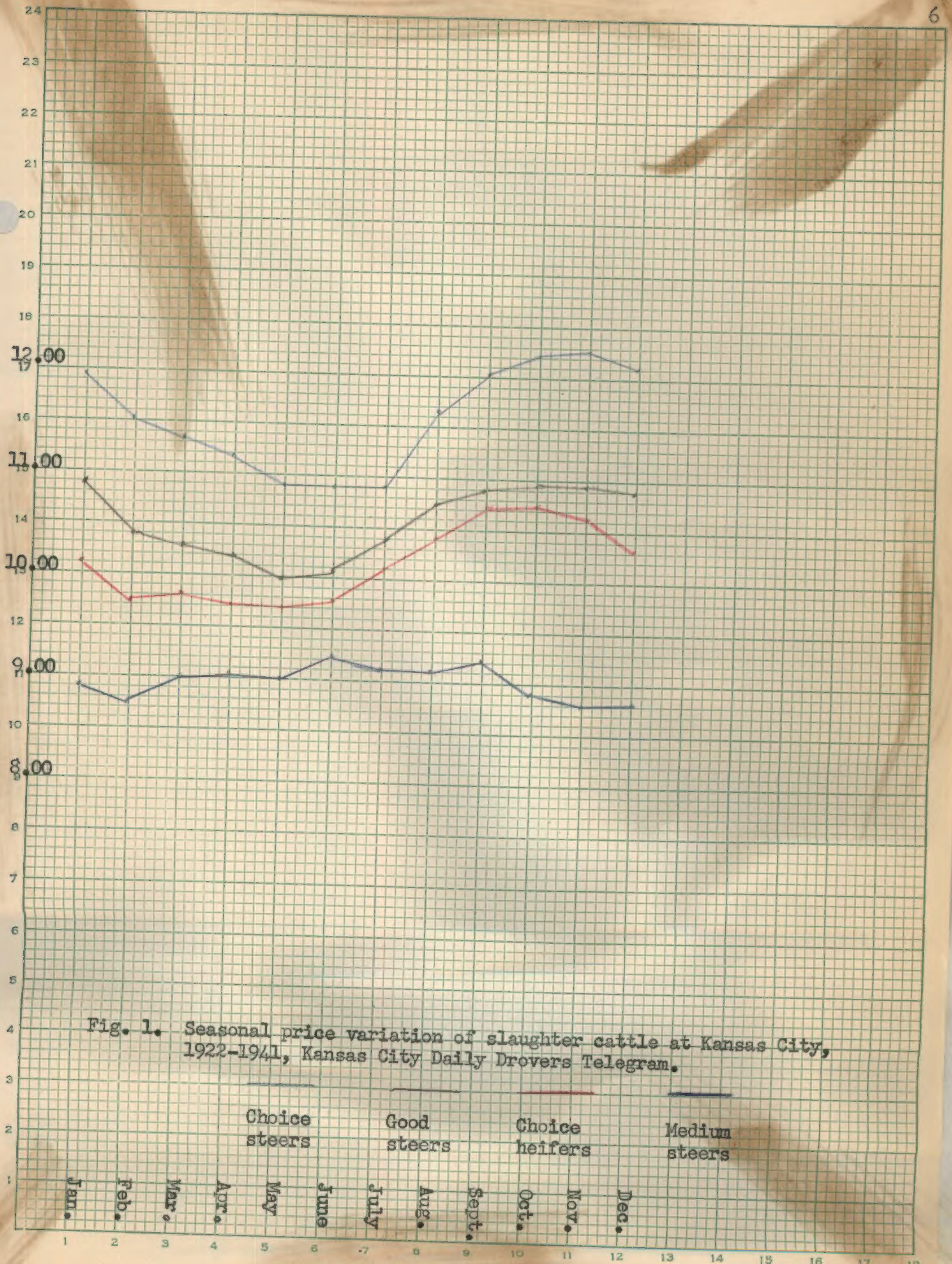

Fig. 1. Seasonal price variation of slaughter cattle at Kansas City, 1922-1941, Kansas City Daily Drovers Telegram.

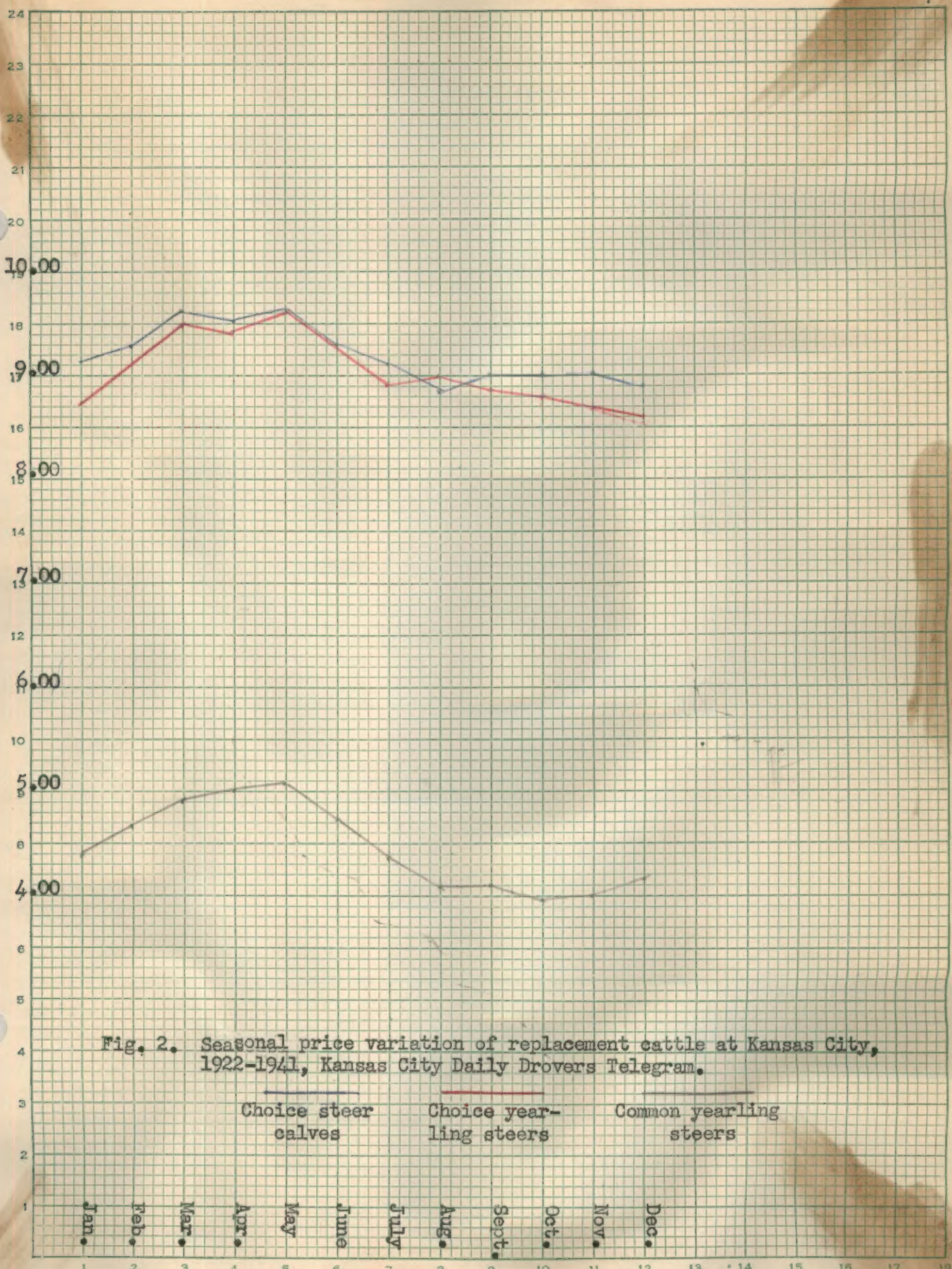

Fig. 2. Seasonal price variation of replacement cattle at Kansas City, 1922-1941, Kansas City Daily Drovers Telegram.

Future Need

In this study, it is the writer's intention to consider as a subcrop land grain that can be either beaked or cut, since harvest usually is on a dual-crop basis as far as land area is concerned. Long-time average, 1921 to 1941, inclusive, (the 20-year period between wars) were used.

In the selection of any period of years to use as an average yield against Mechanization must be considered. Ho period selected represents a period between the two World Wars. From 1921 to 1929 a net precipitation was having decreased. From 1930 to the end of the period the average was less. Those years as compared with those of the past five years were extremely low.

Programs Vary with the Area

Dr. A. D. Weber, Head of the Animal Industry Department, Bill Campbell, Animal Industry Specialist, Glen Vidrine, Dan Murdock Marketing Specialist, and the writer prepared the following map dividing the state into areas and selecting the programs to be emphasized in these areas. Before 1945, certain beef systems were recognized as being consistently profitable in Texas. There was a general acceptance that some systems were adapted better to certain sections of the state than to others, but no specific systems for individual counties had been recommended.

Areas of best adaptation in Texas were based on fundamental characteristics of the counties involved such as: Natural crops, grass type, and grass acreage. Counties that were similar in the above factors were placed in the same area, since they theoretically should make Texas be profitably spe-

ate certain beef system. It must be recognized that while counties that were similar could be placed in the same area, that within these counties wide variations were found. For instance, a county in Area I might have a few farms whose grass acreage was large enough to make them comparable in many respects to farms in Areas IV or V.

The counties in Area I are the corn belt counties where grass is scarce. Blue grass is the principal grass and corn the principal crop. Area II includes the general crop area of southeast Kansas where grass is limited and corn is the predominant crop, followed closely by oats and wheat. Area III is the Flint Hills where bluestem grass is the greatest income producer. Corn and sorghums are the principal crops. In Area IV, wheat is the principal crop, grass is more limited than in Area III and is a mixture of bluestem and the short grasses. Area V is the buffalo grass area. Wheat is the principal crop followed by sorghums. Area V differs for Area VI largely in the amount of grass land. In Area V grass land is dominant while in Area VI, wheat is of more importance.

Table 1. Monthly average prices of farm commodities at Kansas City, 1922 to 1941.

Commodity	Month used	Average price
Corn	October	$ .72
Feeder calves (choice steer)	November	9.00
Heifer calves (choice)	November	8.00
Stocker yearlings (choice)	November	8.70
Stocker yearlings (common)	November	4.00
Slaughter steers (choice)	November	12.20
Slaughter steers (good)	November	10.95
Slaughter heifers (choice)	September	10.75
Slaughter steers (common)	April	7.85

Source: Kansas City Daily Drovers Telegram.

[1] It is a question as to whether one should use $12.20, the average for choice yearlings in November, or $10.95, the average for good yearlings in the same period. In this study for the deferred program, the average of $11.60, April midway between the two grades, was used.

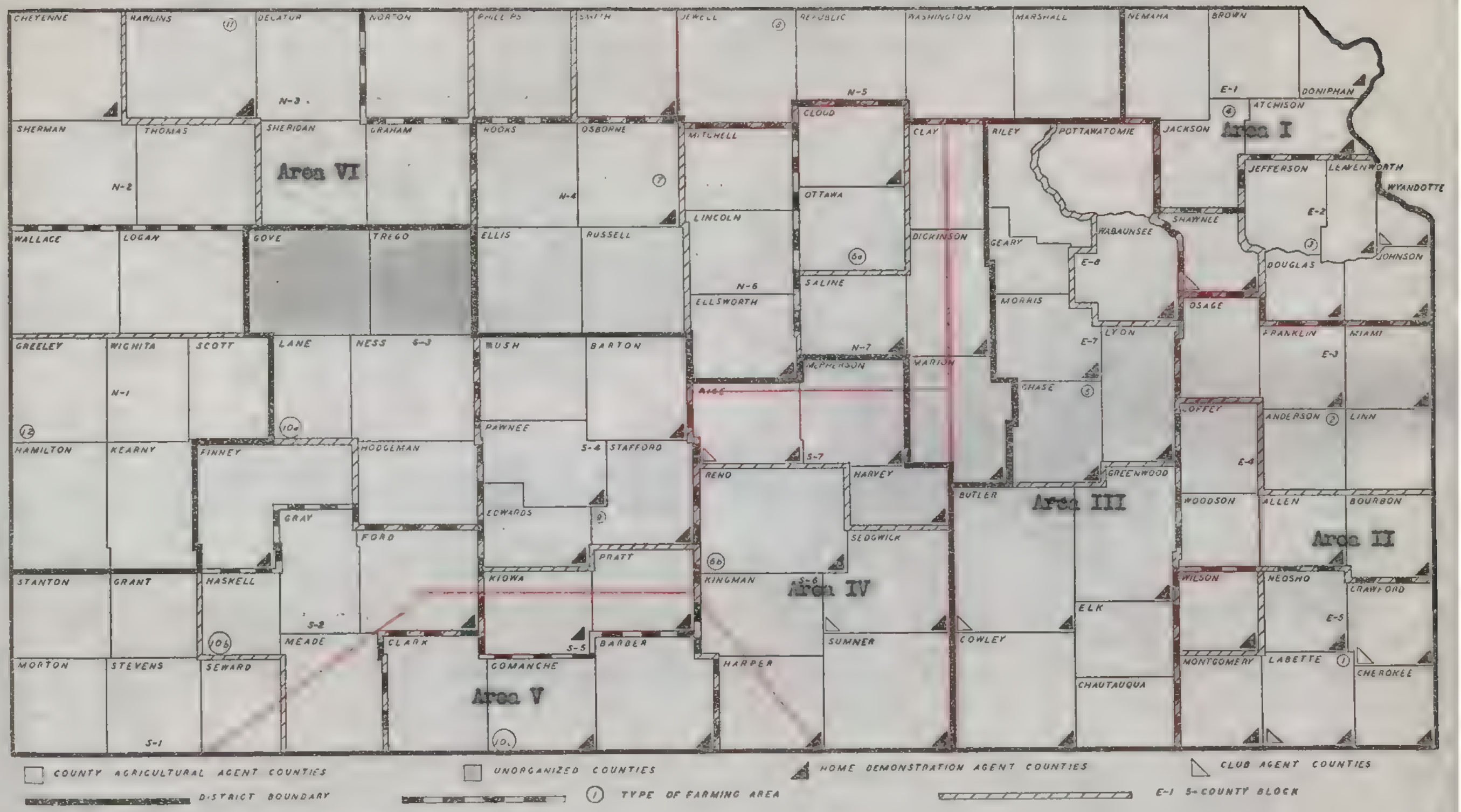

Fig. 3. Beef production areas in Kansas.

The following beef systems are recommended:

Area I, Northeast Kansas Corn Belt

1. Winter full feeding.
   a. Steers (good quality).
   b. Plainer grades.

2. Deferred full feeding (good quality cattle).
   a. Steer or heifer calves.
   b. Yearling steers.

3. Cow herds.
   a. Creep-fed calves.

Area II, Southeast Kansas

1. Deferred full feeding (good quality)
   a. Steer or heifer calves.
   b. Yearling steers.

2. Cow herds.
   a. Creep-fed calves.

3. Winter full feeding.
   a. Good quality steers.
   b. Plainer grades.

Area III, Flint Hills Area

1. Deferred full feeding (good quality)
   a. Steer or heifer calves.
   b. Yearling steers.

2. Wintering and grazing of calves or yearlings to sell as feeders in the fall off grass.

3. Cow herds.
   a. Creep-fed calves.

4. Winter full feeding plainer grades steers only.

5. Summer grazing aged steers usually not locally owned.

Area IV, South Central Kansas

1. Wintering program (good quality, sell in spring)

2. Deferred full feeding (good quality).
   a. Steer and heifer calves.

3. Winter full feeding.
   a. Good quality cattle.
   b. Plainer grades.

4. Cow herds producing creep-fed calves.

Area V, Feeder Calf Area

1. Cow herds.
   a. Feeder calves.
   b. Creep-fed calves.

2. Wintering and summer grazing (good quality).
   a. Calves.
   b. Yearlings.

3. Wintering and sell in spring (wheat pasture).

4. Deferred full feeding.
   a. Steer or heifer calves.

Area VI, Central and Western Kansas

1. Cow herds.
   a. Feeder calves.
   b. Creep-fed calves.

2. Wintering and sell in spring (wheat pasture).

3. Winter and summer grazing (good quality).

4. Deferred full feeding.
   a. Steer or heifer calves.
   b. Yearling steers.

5. Winter full feeding.
   a. Good quality.
   b. Plainer grades.

Kansas Beef Production Systems in Brief

Commercial Cow Herds. These herds are the foundation of the industry. They require an abundance of grass and coarse roughage. There is no reason for handling other than good to choice quality cows.

A greater number of management factors are involved in conducting this system of production than any other system. Some feel that if the farmer has a few cows he has a stable and profitable project. This is far from the truth; as a matter of fact, there is probably a need for more work and improvement on this program than any other program in horses.

A cow herd program is divided into two separate systems: The production of feeder calves and the production of slaughter calves. The success of the production of feeder calves depends on the production of uniform, heavy (450 to 650 lbs.), good to choice quality calves with a minimum of cost. Since a cow is a heavy feeder, an abundance of roughage and grass with sufficient protein supplement is needed. Area providing twice receive grazing are best adapted to feeder calf production. It is a program best adapted to larger cow herds with a minimum of around 100 cows. Smaller herds are at a disadvantage in marketing their calves. These calves sell at a discount, since they are not uniform and large enough to attract the best buyers. Transportation costs are usually higher in small farm herds.

The farmer with a small herd of cows who attempts to produce choice calves to carry past weaning for wintering and grazing can come to really profit; but two or more definite programs with some of them large enough to be profitable. He also will find his management problems with small groups of cattle of different ages and sex, and as a result is more likely to do an inferior job. He often will find such a producer wintering cattle together in one lot which should be divided into several lots, according to age and sex.

The production of creep-fed calves is an intensive system of producing beef and is adapted to all areas where some grain is available. It can be used profitably where herds are small and the cost of keeping cows is relatively high.

Feed requirements are the same for cows as for feeder calves, and in addition 25 to 30 bushels of corn, or its equivalent, per calf is needed to make 750 to 800 pound calves at 12 months of age.

Grain fed to these young calves while getting milk will make more pounds of beef than at any other time. Calves are growing at the same time they are gaining. Feed used in growth puts on more gain than feed used in fattening. During the years 1940 to 1946 this creep-fed system has returned $70 to $90 per cow above calf feed cost as compared to $40 to $60 for feeder calves.

Marketing and management advantages of producing creep-fed calves are:

1. It provides a complete annual turnover of the entire calf crop.

2. Heifers and steers sell together for the same price.

3. The selling price has averaged from $1 to $2 per hundred more than feeder calves.

4. Except for possible replacement heifers, the producer has only one class of cattle to winter and grass, his cow herd. This is important from a labor and management standpoint.

The deferred full feeding of steer calves as a system of producing beef is one of the safest and surest systems. It is well adapted to farms where summer grazing, good winter roughage, and some grain are available. Three distinct phases are involved:

1. Wintering well, with a limited amount of grain needed in most cases to produce a gain of 200 to 250 pounds.

2. Lower grain; ribbon feed for sprouts only 30% bye for a pen of 100 pounds.

3. Full feeding of grain for 120 to 130 days. It is important that each phase be carried out as recommended.

The Kansas deferred full feeding system offers an excellent example of how the two factors, corn price and price trend, work together in making a system of marketing and management over a long period of years. Used to choose steer calves one purchased in the fall when the price of bye replacement cattle is usually in its low position for the year. Bye calves are sold a year later in December or January as good to choice slaughter steers, when the slaughter price is at its seasonal peak. Over the 20-year period used in this study, the average price of bye feeder calves was about $4 cwt below slaughter steers bought an average of 11.20 days earlier and having the a price spread of $3.20.

This Kansas deferred system also has the following advantages:

1. It uses young lightweight quality cattle which provide the most efficient use of feed.

2. It produces a comparatively small investment.

3. Cattle make two double their weight in a year.

4. It provides a regular annual turnover.

5. It produces a medium weight steer of beef which meets the usual consumer's demand for retail cuts.

6. It uses a maximum amount of silage, hay, corn stover, and a minimum amount of grain. This fits Kansas conditions.

The deferred full feeding system of beef production is set up to use steer calves, but heifers may be used. Where heifer calves are used, one or two plans may be followed:

a. Follow the regular plan except that grain need not be fed during the winter phase.

b. Follow the winter ration as set up for steers but do not go to grass or pasture for a short period only. Cereal, clover, bean, or native grass may be used when it is of its best, then grain feed for a 1-to 2-month or early fall period. Choice slaughter heifers in the past have reached the peak in their seasonal price trend in September or October.

Feeding plans may replace steer calves in this system with one variation. Grain need not be fed during the winter period. Silage, other roughages, and grass supplements will be approximately one-third to one-half more per head than for calves. Therefore, fewer cattle can be fed these feedings are used. Where silage, harvest cattle are used, they may go to slaughter:

1. Off grass, without grain.
2. Short fed on grass.
3. Short dry lot fed.

The winter full feeding of good to choice yearly cattle is adapted to areas where an abundance of feed grain is produced and pasture is limited. Where roughages are produced in the fall, the farmer not only has the advantage of the low-priced period but has a better opportunity to utilize fall pasture and crop residue, such as corn stalk and clover fields.

Feed consumed and gains in feeding are important item production; beef with highly concentrated and relatively expensive feeds. This is a very specialized project which requires special attention to the following:

1. Purchase of replacement cattle of the weight, grade, and flesh to fit each individual operator's program. Price relations and feeding ratios are important factors and change from time to time.

2. Balanced rations are extremely important, since efficient gains are essential to profit.

3. Sales are usually made at or near the low seasonal price swing, and, therefore, large margins are not common even though replacements are purchased at the fall low.

4. Extremely long feeding periods should be discouraged.

5. Young cattle require a longer feeding period but are more efficient users of feed.

6. Lightweight cattle also mean a smaller investment and a relatively large gain when compared to the initial weight. Margins between purchase price and selling price do not play as important a part in determining profit or loss as is the case where heavy replacements are used.

7. A program providing a regular turnover every 12 months or less makes for safety and stability. Holding big cattle on feed for long periods in the past has caused trouble for feeders.

8. Feeding to a slaughter grade comparable to the feeder grade handled and to satisfy market requirements.

The winter program of plain or "dogy" grade cattle is particularly suited to the producer who has a plentiful supply of silage, hay, and other good roughage with a limited supply of grain, or where he must buy his grain. Summer grass is not needed, nor is it desirable.

Economy of gain, with the use of roughage, and the seasonal price trend are the important factors in making this a profitable system of utilizing feed.

This is a specialized enterprise and some problems that is not here cannot grain here found it to be highly profitable. Points to note in this system are:

1. Buy replacements in the fall when the price is normally low.

2. Winter on a full feed of silage, hay, and other good roughages. Soybean protein should be fed to balance the ration. Good early fall pasture may be used where available.

3. Feed grain a short period during late winter and early spring. Sell butcher cattle according to their grade.

4. Sell in April or May when the seasonal butcher cattle price is at its seasonal high.

The system of winter and summer grazing with the good quality cattle. It is adapted to farms having an abundance of native grass and producing good rough feed such as silage and hay. No grain is required. Unless a legume hay such as alfalfa is raised, a protein supplement must be purchased. Replacements are purchased in the fall, wintered, summer grazed, and sold to feeder buyers off grass.

This program is better adapted to more extensive operations. Unless a sufficient volume of feeders of recognized quality is available, the seller will be at a disadvantage. It would be advantageous for several operators in one county or locality, who follow this system, to buy cattle of the same type or quality in the fall. In this way, they could have enough sufficiently large to attract corn belt feeder buyers.

This program differs from the deferred system in that no grain is fed in the winter months, since a lack of approximately 100 pounds is tolerable. Cattle wintered in this manner sell for less gross sales. The cattle are sold off

[illegible] in the full ration but under fed cows. Cattle from this ration should calve at least 2 pounds of milk per calf more than should be expected.

The amount of roughage fed cows in the study is also important, depending on locality and type of feed available. It is easily obtainable from calculations which are made in the study to find how it can be used to get the greatest possible gain from each feed under the ration. A feeding ration ranging from 12 to 15 may be expected over a period of years.

Mechanics of Computing Income

In computing the income that may be derived, the prices listed on page six were used. Gains used are as follows:

	Pounds
Steaker and feeder calves	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Deferred steer calves	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Full feeding yearling steers	[illegible]
Full feeding plain steers	[illegible]
[illegible]	[illegible]

In computing [illegible], cost, as previously explained was treated as a cash cost since the value of a beef calf/cow is a fixed fee, to a great degree, in relation to which the cash feed cost was given. For this reason, instead of calculating net income, the author has calculated returns for cash feed cost given.

Table 2. Estimated daily feed requirements for beef calves in Iowa.

Program	Pounds of feed			
	Grain	Alfalfa	Silage*	Supplement
Wintering 700# yearling		6	40	
150 days--2T alfalfa hay				
3T silage				
Full feeding 700#	16	2	15	1.5
150 days--3 bu. grain				
1T silage				
225 supplement				
Wintering cow		8	50	
150 days--1/2T alfalfa				
3.75 silage				
Creep-fed calf	6			
10 months 27 bu. grain				
Deferred steer calves				
winter		4	25	
full feed	12	7		1.0
total--39 bu. grain				
2T silage				
1/2T alfalfa				
100 supplement				
Deferred heifer calves				
winter		4	25	
full feed	12	7		1.0
Deferred yearling steers				
winter		6	40	
full feed	20		15	1.0
total--51 bu. grain				
1/2T alfalfa				
3 1/2T silage				
600# supplement				

*If silage is not available, bundle feed or prairie hay can be substituted on the basis of one pound of rough feed equals three pounds of silage.

Method Used

Stocker and Feeder Calves. On a farm that could handle 100 cows, assuming that they produced 100 per cent calf crop, 100 calves weighing 400 pounds could be sold at weaning time. Average price for these calves according to Table 1 would be [illegible] per hundred or a return of [illegible] per cow, or [illegible],600 for the rough feed and grass on the farm.

Wintering and Summering Calves. If the above farm could successfully handle 100 cows and calves, it could winter and summer 200 calves. These calves would gain 200 pounds a head and should sell for [illegible].70, Table 1, per hundred, bringing in a return of [illegible].10 per head, or a total return of [illegible],200 for the rough feed and grass.

Creep-fed Calves. On the farm used in the previous illustration, the operator might choose to handle 100 cows and produce creep-fed calves. Again assuming that he saved 100 percent calf crop, his returns would be as follows: 100 creep-fed calves weighing 700 pounds selling for [illegible].20, Table 1, per hundred would bring in [illegible].40 per cow. Twenty-seven bushels of grain at .72 should be subtracted, leaving a return of [illegible].96 per cow for rough feed and grass, or a total return of [illegible],591 for the livestock program on the farm.

Deferred Steer Calves. On the same farm the operator might choose to handle 200 steer calves on the deferred system. A 1,000 pound steer could be sold in November for [illegible].60, Table 1, which would bring in [illegible]16. From this, must be subtracted the original purchase price of [illegible]6 and the cost of 35 bushels of grain at .72, Table 1, leaving a return of [illegible].80 per head, or a return of [illegible],960 for the livestock program.

Deferred Heifer Calves. If 200 heifer calves were selected by the operator to be handled on the deferred plan, or 800 pound heifer would be sold in September or October for $10.75, bringing in $86. From this would be subtracted the purchase price of $32 and the cost of 80 bushels of grain at .72, leaving a return of $39.60 per head, or $7,920 for the program.

Deferred Yearling Steers. If the operator chose yearling steers about two-thirds as many yearling steers as calves could be handled; consequently, about 125 yearlings could be handled. These yearlings would weigh approximately 1,150 pounds and would bring $12.20, Table 1, per hundred, or $140.30 per head. From this total the purchase cost of $40.00 should be subtracted as well as the cost of 21 bushels of grain at .72. This leaves a return of $64.26 for rough feed and grass per head, or $8,035 for the livestock program.

Bull Feeding Feed Lot to Yearling Steers. In considering the next three systems, since no grass is involved, 125 head of cattle will be used. Table 1 shows that in April choice slaughter steers sell for $11.15. These steers would weigh around 1,070 pounds and would, therefore, bring $117.07. From this, the purchase price of $67.00 should be subtracted together with the cost of 43 bushels of corn which would leave a return of $25.21 per head for rough feed, or $3,151 for the feeding operation.

Bull Feeding Plain Steers. In this program the steers are wintered on rough feed for the first three months and then given a short a 60-day grain feeding period to finish them. By April, these steers should weigh 965 and sell for $7.65, Table 1, bringing in $72.71 per head from which a purchase price of $20 and the cost of 17 bushels of grain at .72 should be subtracted. This leaves a return per steer of $32.47, or $4,056.75 for the farm.

Wintering Good Quality Yearlings. If the operator has no grass and chooses to winter 125 choice yearlings selling 850-pound choice stocker steers in April, they would bring $9.45, Table 1, or a total of $80.32 per head. After the purchase price of $60.90 is subtracted, a margin of $19.42 per steer is left, or $2,427.50 total return for the rough feed.

Wintering and Grazing Good Quality Yearling Steers. In this program the operator would buy 125 good quality yearlings in the fall, winter them, grass them through the summer and sell them the following fall. There would be no advance in price per hundred since they would still be in the stocker and feeder class. This would result in selling approximately a 400-pound gain at $9 per hundred, a return of $36 per head, or $4,500 total return for the beef operation.

Additional Costs on Above Programs

The method of figuring costs and returns described above does not include certain incidental charges such as interest, shrink, commission charges, and freight. These charges might make one program less profitable than another program.

To illustrate this, compare a creep-feeding system, where the operator raises his own calves, with a deferred system, where cattle are bought in the fall, wintered, put on grass, given a short feeding period, and sold the following fall. In the creep-feeding system, only one commission and one freight charge is paid when the calves are sold. On the deferred system, there are two commissions and two freight charges since the calves are first purchased, then sold. However, depreciation or cost of replacement must be charged against a cow herd.

For the years 1927 to 1943, the average price for cows was $7 a hundred. Taking 1,100 pounds as the average weight for a cow, it would be valued at $77. At five percent interest, the interest would be $3.85 per cow. It would cost $1.54 to ship the fattened slaughter cull, using a freight rate of .35 a hundred. The commission charge per calf would be .75. The average cow has a depreciation of 14 percent a year. (In Kansas she would be replaced at eight years of age; however, as a farmer a portion of the value would be salvaged. If cattle were valued at $4 a hundred the annual interest would be $2, since the weight of the cow would have increased from 1,100 to 750 pounds. The depreciation, then, would be $11 for the five productive years, or 15 percent of the original value.) With interest, freight, commission, and depreciation, the additional cost of feeding the slaughter calf is $14.14.

The fattened calves would be handled instead of a yearling calf. The calves would cost $7 a hundred, while a yearling was $5 a hundred. The interest at five percent would be $3.5. Since the calves would gain 500 pounds, the cost would be $5. The freight (for eight) bill would be $1.44. There would also a total additional charge of $19.44 on the fattened system. Thus, there is no significant difference in the additional costs of the two systems.

In the above calculations, which can not take into consideration, it is generally accepted that the market on the fleshy slaughter is not a loss since it is regained almost immediately.

FACTORS THAT INFLUENCE THE PROFIT ON A CERTAIN FARM

1. Amount and kind of grass and the carrying capacity of grass available.
2. Crop land available.
3. Fertility of crop land.
4. Size of operation.
5. Desire and experience of the operator.
6. Equipment.
7. Amount of labor necessary to operate.
8. Ability of dairy animals to consume rough feed and stalk fields to advantage.
9. Dairy cattle fatten to a greater degree on grass and put on more gain.
10. Loss are received by dairy cattle during winter.
11. Ability of younger animals to utilize feed to better advantage.
12. More profit in dairy animals in time of changing price.
13. Insurance factor in younger animals in case of declining price.
14. Advantage of cow herds over replacement cattle in low cash outlay.
15. Location of pasture and its effect on cattle operation.
16. Number of cattle under different ownership during grazing season.
17. Prominence of that program in that area.
18. Investment.

A combination of the first two items give a factor known as the grass-land crop land ratio.

A farm, having crop land with better than average fertility, is adapted to a more intensive livestock program, while a farm with crop land of less

than average fertility is adapted to a less intensive livestock program. Farms on bottom land with fertile soil can produce feed much more consistently than can a farm with crop land consisting of thin, infertile upland. The farm that can produce grain is, therefore, better adapted to a winter full feeding program, or to one of the deferred programs where grain is essential. The farm that consistently produces rough feed and a smaller quantity of grain fits into a wintering, wintering and summering, or a cow herd program. Consequently the operator of such a farm, recognizing the shortcomings of his land but still wishing to operate one of the more intensive programs, will produce the rough feed on his farm and buy the feed grain.

Size of operation or size of business as it is called in farm management studies is quite important. Farm management studies have shown that there is a definite correlation between gross income and net income and that to have a large net income one must first take in a large amount of money. Certain beef systems are much less intensive than others. Handling stocker and feeder calves, one of the programs recommended for western Kansas where acreages are large, is much less intensive than the deferred calf program.

Ranking the programs in order of their intensity, they are listed as follows:

1. Winter full feeding.
2. Deferred Programs.
3. Creep-fed calf program.
4. Wintering and summering.
5. Production of stocker and feeder calves.
6. Wintering. (sell in the spring)
7. Leasing of pastures.

Cattle fall feeding has been limited in its by size as income size of business can be spread on a very small unit of land; however, if profitably is secured on a profit per bushel basis, fall feeding would not. Less.

A large steer or steer might have a very acceptable net income. Loading of persons or from a short-term soil conserving program, but the same system would not furnish a large enough volume of business on a small steer farm to give a satisfactory income.

Losing and experience of the operator, while quite important, cannot be measured in a study of this type. Certain operators who have had experience with a cow herd prefer them to a replacement cattle program others do not.

Equipment is, in general, of minor importance, a program that calls for fall feeding requires feed bunks, fences, grain storage capacity, and a well drained feed lot, none of which are so vital in raising steer and feeder cattle.

Amount of labor necessary to operate has a considerable with size of business and is also important. For size of illustrated, we doubt the deferred program would bring in more income on a large settlement farm than would producing steers and feeder calves; but it would also take much more labor and capital. The production of steer and feeder calves could be largely handled by the operator. The deferred fed calves require much more labor and capital during the fall feeding period. The consideration of housing and management of this labor, in many cases, would have a tendency to cause the operator to choose a less intensive program.

The ability of older animals to consume rough feed to an advantage is important in certain sections of the state. Young cattle (calves) are not considered desirable, by many operators, in the eastern part of the state. This is due to the fact that young cattle do not have as great a capacity for rough feed as do more mature animals. These stockmen point out that cows and yearlings can be wintered in stalk fields or on bundle feed more satisfactorily than can calves. While mature animals have a greater capacity for rough feed, calves need feeds with more digestible nutrients in order to put on fat while they are growing.

This same ability which enables the older animal to use rough feed to an advantage also enables the older animal to put on more gain on grass and fatten to a higher degree of finish than can calves.

Ability of older cattle to require slightly less care during the winter is claimed by some farmers who prefer yearlings to calves. Often these same farmers who point out that yearlings can consume rough feed better than calves, point out also that older cattle require less attention during the winter than do the calves. Scours and hemorrhagic septicemia (shipping fever) are less common in older cattle than in calves. Older cattle are more rugged and need less housing. This point is debatable, since in most sections of Kansas a group of good quality, vigorous calves can be wintered with no housing other than a windbreak or, at most, an open shed for severe storms. However, death loss may be slightly larger with calves than with older cattle.

Young cattle have the ability of using total feed to a better advantage than older cattle. The following table taken from Reece R. Snapp's (6) "Beef Cattle", page 213, illustrates this point:

Table 3. Influence of age upon economy of gains.

Age	Days			
	[illegible]	[illegible]	[illegible]	[illegible]
Day matter per pound of gain	5.36	11.26	17.02	23.45

The economy of gain in favor of calves was due to the following factors:

1. Calves are growing while they fatten. Fat requires more digestible nutrients for a hundred pounds of gain than lean muscle fibre.

2. Calves consume a larger amount of feed in proportion to their body weight than do older cattle.

3. Calves masticate their feed better than older animals.

4. Because calves consume more feed in proportion to their body weight, there are more nutrients left over to make them gain after their maintenance requirement is met.

Calves have a factor of insurance in their favor in times of declining price. During a period when the general level of the cattle market drops $3 per hundred from one fall to the following fall, only $12 per head would be lost on the original investment with a 400-pound calf while $21 per head would be lost on the original investment in a 700-pound yearling. Using this same reasoning in a period of increasing prices, more money can be made on the

higher cattle. However, the critical years in the cattle business have not been the years when prices increased but those they decreased. It must be concluded that having a period such as the war period that has just passed, overstocked with foresight and marked information study method higher cattle due to the fact that their information included a statistical period of constantly increasing prices.

Our lands have been reduced by some quantum over replacement cattle for several reasons. As was mentioned earlier in this discussion, our lands consume rough feed to a better advantage than do younger cattle. They consume relatively that a cow herd in particular because no such outlay is made for replacement stock. Here question arise out but in time when cattle prices are declining, a replacement cattle program might prove less profitable due to the decline in price here the loss of profits will be cattle are sold. A cow herd simply brings in less return for rough feed and grass. Some expenses for a cow herd may be saved, for a study of the Dupuy ranch and in this locale where the cow herds (if not profitable cropped calves) reduced the forest grazed herd for a given area and most often brought in the smallest returns for rough feed and grass, Table 4.

The location of the pasture and herd is to be considered when the choice is to be made was between steep feeding and deferred feeding. A pasture that is far from the improvements like each better with a deferred program than with a cropped calf program. This is true due for a cow herd pasture providing shelter and feeder calves, since one reasons more attention or more time to the calves or yearlings on a deferred program. Some the problems that confront the owner of a distant pasture are:

1. Danger of getting cows with calf to a scrub bull.
2. Cost of an extra calf crop at a distance from improvements.
3. Greater difficulty in watching cows for spoiled bags.
4. Late calves could be watched less readily.
5. Difficulty of keeping grain in creep feeder on a creep feeding program.

On a deferred program, the cattle receive no grain during the pasture season, and, consequently, require a minimum of care.

Cattle of mixed ownership grazing on the same pasture present several problems. Occasionally an operator had either more pasture than he had cattle to fill it, or the reverse was true, he was forced to put some or all of his cattle in a pasture with someone else's cattle. In either instance a cow herd program was much less satisfactory than a replacement cattle program. The difficulty of the "neighbor's bull" made keeping cows a problem. The creep feeding of calves was virtually impossible in either case.

A stockman looking for a system should study the systems followed by the majority of successful cattlemen in his area. A stockman, producing stocker and feeder calves, will command a better price if he were located in Clark, Comanche, Barber, or Ford County than if he were located in Clay County. The settlement area of Kansas has a reputation for producing high quality stocker and feeder calves. Therefore, the corn belt buyer is more likely to be looking to the settled area of Kansas for stocker and feeder calves than in a section less well known as a stocker and feeder area.

Investment varies widely between the different programs. Cow herd programs require the largest investment, while calves handled on either the deferred program or on a wintering and summering program require the least.

AREAS IN KANSAS FOR WHICH BEEF CATTLE PROGRAMS ARE RECOMMENDED IN THIS STUDY

Area I, Northeast Kansas Corn Belt

This area includes the following counties: Jewell, Republic, Washington, Marshall, Nemaha, Brown, Doniphan, Jackson, Atchison, Jefferson, Leavenworth, Wyandotte, Douglas, and Johnson.

There is a greater acreage of crop land than of grass land in this area. Native grass is limited, with blue grass most abundant in the northeastern part of the area. A mixture of buffalo, grama, and bluestem is prominent in the western part of the area. Crop land varies from the fertile loessial soil of Doniphan and Brown Counties to the badly eroded soil of Jewell County. Corn is the principal crop. A large percentage of the farms are cash crop farms.

The following programs are recommended in Area I:

1. Winter full feeding
   a. Good quality steers.
   b. Plainer grades.
2. Deferred full feeding (good quality)
   a. Steer or heifer calves.
   b. Yearling steers.
3. Cow herds producing creep-fed calves.

In considering the various programs adapted to this specific area and to specific farms in each area, purebred herds should be listed. For the purpose of this study, however, purebred herds will not be included. To be

a successful purebred breeder requires business ability and practical judgment in selecting and recognizing quality. The success of the purebred breeder rest largely on the shoulders of the individual himself. Unless the operator was interested in the purebred business, this project should not be practical, even though the required physical attributes for the farm are present.

There are two criterons found in analyzing the various programs that fit this area. A cattleman whose program is a winter full feeding program does not need grass. An operator whose cattle program is a cow herd program needs a large acreage of grass. In this area, it is apparent that since grass is the limiting factor, on many farms, the lack of grass makes winter full feeding the only beef cattle program possible. On these farms, the choice must be made as to the grade of cattle to be fed.

Under the method used on page 23, it will be noted that a return of $22 a head on plain yearlings was obtained as compared to $25 on good quality steers. This margin in favor of plain yearlings is due to the fact that plain cattle are bought at their seasonal low and sold as slaughter cattle at the seasonal high for their grade. Good quality cattle are purchased at the correct time, but they are sold at their seasonal low, Figs. 1 and 2. The profit made on plain yearlings is made in the spread between the purchase price and the sale price. The profit made on good quality steers is made by selling the gain to a good advantage. Thus, in a normal year, greater margins can be expected in the feeding of common cattle. However, in years when the general level of cattle prices is exceptionally high, the gain in weight by quality cattle can be sold at high enough prices to bring in a satisfactory return.

The fertility of crop land in this area is generally good. There are some farms that have crop land on this upland that can produce silage to a better advantage than corn. Some farms should consider, if they have no grass, the handling of plain yearlings rather than good quality cattle, since the plain yearlings consume more rough feed.

On farms that have corn grass, the operator has a much greater choice of programs. He may possibly any of the deferred system and up, if he so chose, produce exceptional calves. If there is a considerable acreage of grass located close to the farm improvements, and if the operator desires the advantage that corn have over one of the deferred systems in their ability to utilize stalk fields, he should handle corn.

In this area, a large acreage of fertile crop land is being needed to have grass and sweet clover. Any of the deferred system fit this kind of a pasture program exceptionally well. They can utilize the pasture early in the spring and in the fall; during the summer from August on, the cattle are in the dry lot receiving a full feed of grain. A corn hard program cannot be handled as well on a farm having; tame grass pasture because a corn land is handled 12 months out of the year. The operator should have some native grass to take the corn through the summer months.

Size of operation is quite important in this area. Most farms are small; therefore, one of the more intensive cattle programs should be used.

In the past, this area was prominent in full feeding big cattle. However, the deferred calf program has been generally adopted in the last few years. This was done under the leadership of the county agents in that section. Both heifer and steer calves have been used successfully in this program.

Farms in this area that have too narrow a grass crop land ratio for one of the deferred systems, can, by using tame pasture on crop land, successfully handle a deferred system.

Table 4 gives the grass crop land ratio, the feed budget required, and the expected return for rough feed and grass for each of the programs recommended in this area.

In Area I, six acres of grass are required to carry a cow during the grazing season, three acres for a deferred calf, and four acres for a yearling. In this area, the normal yields (15-year average 1911-1926, State Board of Agriculture), are as follows: Silage, 10 tons per acre; corn, 25 bushels per acre; and alfalfa, two tons per acre.

Area II, Southeast Kansas

This area is south of Area I and east of the Flint Hills. The following counties are included in this area: Montgomery, Labette, Cherokee, Crawford, Neosho, Wilson, Allen, Bourbon, Anderson, Linn, Miami, Franklin, and Osage. Crop land predominates in this area. The fertility of the crop land, in general, is lower than the fertility of the crop land in Area I. Blue grass is the predominant grass, but the grass land includes more or less a mixture of grasses. On the western edge of the area, which borders on the Flint Hills, bluestem and grama grasses are to be found. Farms are small. The principal crops are corn, wheat, oats, and sorghums.

Table 4. Feed requirements, acres required to produce feed, grass crop land ratio, and return for rough feed and grass for beef programs in Area I.

Program	Feed budget: Silage tons	Alfalfa hay tons	Grain bushels	Acres to produce	Grass acreage	Grass crop land ratio	Return for rough feed and grass
Winter full feed 35 good quality yearlings	35	6	1505	67			$ 882.35
Winter full feed 35 plain yearlings	68	12	595	37			1196.45
Defer 50 steer calves, good quality	100	25	1750	93	150	1.6	2760.00
Defer 50 heifer calves, good quality	100	25	1000	63	150	2.4	1900.00
Defer 35 yearling steers, good quality	122	18	735	50	140	2.8	2249.80
Creep feed 25 cows and calves	94	13	675	45	150	3.3	1644.00

Area II is principally a dairy section. Farm operators, who do not wish to operate dairies, have been searching for a beef program. The lack of a beef program has prevented many farms from being operated as efficiently as they might be.

Carrying capacities of the pastures are about the same as in Area I. Pasture requirements are: Six acres per cow, four acres per yearling, and three acres for a calf. Corn and kaffir have yielded 30 bushels per acre over a period of 15 years (1911-1926, State Board of Agriculture); alfalfa, 2.5 tons; and silage, 10 tons.

Programs recommended:

1. Deferred full feeding (good quality).
   a. Steer or heifer calves.
   b. Yearling steers.
2. Cow herds.
   a. Creep-fed calves.
3. Winter full feeding
   a. Steers (good quality).
   b. Plainer grades.

It will be noted that the programs recommended for this area are identical with those recommended in Area I.

In this area, grain yields are less than Area I, while roughage yields are equal or greater. Because of this fact, more emphasis should be placed on the deferred programs and less on winter full feeding.

Since the programs are identical with those recommended for Area I, the carrying capacities identical, and the crop yields very similar, refer to Table 4 for an analysis of the program.

Area III, The Flint Hills

This area is known as the Flint Hills or the Bluestem area. It is famous throughout the world as a cattle grazing section. The following counties are included in Area III: Riley, Pottawatomie, Geary, Wabaunsee, Morris, Chase, Butler, Greenwood, Cowley, Elk, Chautauqua, and parts of Marion, Dickinson, and Clay. Grass land predominates in this area. On a typical Flint Hills farm a large portion of the land will be in grass with the crop land restricted. Many farms in this area have grass on the hills. There is a small amount of crop land in the bottoms of the small streams that originate in this part of Kansas.

Corn, sorghum, and alfalfa are the principal crops produced. The pastures include the following grasses: Big bluestem, little bluestem, side-oats grama, hairy and blue grama, as well as switch grass, Indian grass, and a variety of triplocums and dropseeds.

The soils in this region have been formed from limestone and are typically shallow.

Programs recommended:

1. Deferred full feeding (good quality).
   a. Steer or heifer calves.
   b. Yearling steers.
2. Wintering and grazing of calves or yearlings to sell as feeders in the fall off grass.

3. Cow herds.

a. Creep-fed calves.

4. Winter full feeding.

a. Plainer grades only.

5. Summer grazing and steers, usually not locally owned.

In this area, the pasture and crop land ratio is the reverse of the ratio found in Areas I and II. On some ranches the amount of grass, as compared to crop land, makes only one program possible. That program is summer grazing. Since purchase of cattle in the spring for sale in the fall off grass is a hazardous program, many of the stockmen take in southern cattle for the grass season rather than run the risk of a price break on their own cattle. A large part of this area is now, and probably should always be, grazed by southern cattle. A considerable portion of the grass land through the heart of the Flint Hills is owned by absentee landlords as an investment. This land is often turned over to a pasture operator who takes in the cattle and looks after the water and grass.

Here, size of operation is larger than in the first two areas, so less attention has to be paid on the average farm to the intensity of the enterprise. Wintering and summering, one of the less intensive programs, finds favor in many sections of the Flint Hills since a relatively few crop acres can produce enough rough feed to winter a large number of cattle. On this program, many of the operators prefer yearlings to younger cattle because of their ruggedness and their ability to consume rough feed.

In the past, the Flint Hills area has placed more emphasis on the handling of older cattle. They will make greater gains and fatten better on grass than will younger cattle. However, this area is rapidly changing to one of the deferred programs, particularly on the smaller farms where intensity is more important. Cow herds have largely been liquidated. On most of the farms having a cow herd, the creep-fed calf program is now being used.

Full feeding is practiced only to a limited extent in this area since crop land is limited. Most programs are based around the use of the grass land.

Carrying capacities of grass lands in Area III are the same as in the two previously mentioned areas; namely, three acres per head for a calf; four acres per head for a yearling; and six acres per head for a cow. While the acreages allowed per head are the same as in Areas I and II, superior grass normally gives the stockman larger gains per season.

Yields of crops in this area are as follows: (State Board of Agriculture 15-year average, 1911-1926) kafir, 16 bushels per acre; corn, 19 bushels per acre; alfalfa, three tons per acre; and silage, 10 tons per acre.

Area IV, South Central

The counties included in this area are: Sumner, Sedgwick, Harvey, McPherson, Rice, Reno, Kingman, and parts of Harper and Marion Counties.

Most of the soils in this area are western residual soil. They are typically deep and are well adapted to general farm crops. Wheat is the principal crop. Due to this fact, most farm organization systems are based on wheat as the major enterprise. Other farm organization systems are accepted or rejected largely on the basis of how they complement the wheat plan already in operation.

Table 5. Feed requirements, acres required to produce feed, grass crop land ratio, and return for rough feed and grass for beef programs in Area III.

Program	Feed inputs: Silage tons	Alfalfa hay tons	Grain bushels	Acres to produce	Grass acreage	Grass crop land ratio	Return for rough feed and grass
Wintering and grazing 200 good quality calves	400	100		73	600	8.2	$ 5,220
Creep feeding 100 cows and calves	376	52	2700	202	600	3.0	6,596
Wintering and grazing 150 yearling steers	450	150		95	600	6.0	5,400
Defer 150 yearling steers	525	75	3150	244	600	2.4	9,632
Defer 200 heifer calves	400	100	4000	283	600	2.1	7,920
Defer 200 steer calves	400	100	7000	443	600	1.5	10,960
Winter full feed 150 plain yearlings	300	50	2550	216			4,870

As far as grass is concerned, this area is intermediate. It is between the long grass area of the Flint Hills and the short grass area of western Kansas.

Programs recommended:

1. Wintering program (good quality sell in spring).
2. Deferred full feeding (good quality).
   a. Steer calves.
   b. Heifer calves.
3. Winter full feeding.
   a. Good quality cattle.
   b. Plainer grades.
4. Cow herds.
   a. Drop-fed calves.

The average carrying capacity for the grass in Area IV is: Four acres per head for calves, five acres for yearlings, and eight acres for cows. Long-time yields (1911-1926, State Board of Agriculture) show corn and kafir, 15 bushels per acre; oats, 20 bushels; alfalfa, 2.6 tons; and silage, 8 tons.

In this section of the state, wheat is of great importance. Level crop land is plentiful and is of good fertility. Size of operation in this area is larger than Areas I and II. The equipment on most farms is power equipment for the production of wheat. Combine sorghum production uses the same equipment; therefore, these sorghums can be utilized as feed grain. Cattle programs fit in well as far as labor division in this section is concerned. Heavy seasons for labor on a wheat farm are during seeding and harvesting. The deferred systems do not interfere with the harvest season since the cattle

are on pasture at that time. Handling steer calves on the standard deferred plan does interfere with the planting season because the steers are in the fattening pen. Handling heifer calves on the deferred plan does not interfere with either rush season. From the labor standpoint, both the wintering program and the winter full feeding program also are ideal.

Since in this area, wheat is the principal crop, wheat pasture, when available, should be utilized to the fullest extent. The wintering of good quality cattle on wheat pasture and their sale in the spring is quite profitable. However, a beef program to be sound for the individual farm should be adapted to years when wheat pasture is not available. The wintering program can be made profitable without wheat pasture by the production of sorghums for feed. A stockman can utilize wheat pasture when it is plentiful and in seasons when it is scarce resort to silage.

Scattered through this section are a few cow herds producing stocker and feeder calves. Grass acreages are usually too small in this section to make a stocker and feeder calf program successful. Stockmen, who desire a cow herd, should consider creep feeding their calves.

In recent years, the deferred systems have become widespread throughout Area IV. From all indications these systems fit into the farm organization plans of this area in excellent shape.

Table 6. Feed requirements, acres required to produce feed, grass crop land ratio, and return for rough feed and grass for beef programs in Area IV.

Program	Feed budget: Silage tons	Alfalfa hay tons	Grain bushels	Acres to produce	Grass acreage	Grass crop land ratio	Return for rough feed and grass
50 winter yearlings sell in spring (good quality	75*	25		19			$ 971
50 deferred steer calves (good quality)	100	25	1750	125	200	1.6	2740
50 deferred heifer calves (good quality)	100	25	1000	89	200	2.2	1900
35 deferred yearling steers (good quality)	123	18	735	62	175	2.8	2250
Creep feed 25 cows and calves	94	13	700	64	200	3.1	1650
Winter full feed 50 yearlings (good quality)	50	9	2150	129			1260
Winter full feed 50 plain yearlings	100	17	750	57			1623

*Since wheat pasture is used in the wintering program, half of the rough feed normally considered necessary was used in preparing the feed budget.

Area V, Feeder Calf Area (Comanche Peal Area)

Area V consists of Comanche, Barber, Clark, parts of Kingman, Harper, Pratt, Kiowa, Ford, and Meade Counties. A variety of soil types are found in this area. Topography varies from level upland of high fertility, particularly adapted to wheat farming, to rough rolling cow country, such as is found around Sun City in Barber County.

According to work done by Hodges et al. (2), this area and Area III lead the state in the amount of pasture as compared to crop land (2). In the same study, they found that there were more beef cows per thousand acres of crop land in Area V than any other area in Kansas.

Before World War II, this section of Kansas was known throughout the nation as the cow herd area of Kansas. Since the war, the cow herds have materially decreased.

The grass of Area V is typically buffalo with a mixture of the grama grasses. It is known as the short grass country. The carrying capacity per acre in this area is as follows: Calves, five acres, cows, 10 acres, and yearlings, seven acres.

Although wheat is the principal crop, a great deal of feed is grown as well as some alfalfa. The State Board of Agriculture gives the following long-time average yields (1911-1926) for this section: Wheat, 10 bushels; kafir, 13 bushels; alfalfa, 2.5 tons; silage, 7.5 tons; milo, 14 bushels; and barley, 15 bushels.

Programs recommended:

1. Cow herds.
    a. Feeder calves.
    b. Creep-fed calves.

2. Wintering and summer grazing (good quality).

   a. Calves.

   b. Yearlings.

3. Wintering and selling in spring (wheat pasture).

4. Deferred full feeding.

   a. Steer or heifer calves.

Farms and ranches in this area that have a large amount of grass as compared to crop land should produce stocker and feeder calves. The low wintering and summering costs and particularly the large size of the ranches involved make this program very desirable. As was pointed out earlier, any of the deferred systems would bring in much larger returns per acre, but in these programs, more labor, management, and capital would be involved.

Rainfall is generally the limiting factor in this area. Summer fallow should be practiced not only with wheat but also with sorghum crops to insure a continuous supply of rough feed.

Here, as in Area IV, equipment is large and adapted to wheat farming, but it also can be used for the production of grain sorghums. The deferred programs in this area depend on the use of grain sorghums. During the three years of feeding grain sorghum to yearlings at the Fort Hays Experiment Station as reported in the 1948 feeders day circular by Aicher and Kessler (1), grain sorghum equalled corn pound for pound. These results were not specifically on the deferred program, but essentially the same results could be expected. It appears that with the development of better storage facilities for grain sorghums in western Kansas, there will come a rapid acceptance of the deferred systems.

Table 7. Feed requirements, acres required to produce feed, grass crop land ratio, and return for rough feed and grass for beef programs in Area V.

Program	Feed budget: Silage tons	Alfalfa hay tons	Grain bushels	Acres to produce	Grass acreage	Grass crop land ratio	Return for rough feed and grass
100 cows producing stocker and feeder calves	375	50		70	1000	14.2	@ 3,600
150 yearlings wintering and grazing (good quality)	450	150		120	1050	8.7	5,400
150 yearlings, winter, sell in spring (good quality)	225*	75		60			2,913
150 yearlings deferred (good quality)	525	75	3150	310	1050	3.4	9,642
200 steer calves deferred (good quality)	400	100	7000	557	1000	1.8	10,960
200 heifer calves deferred (good quality)	400	100	4000	367	1000	2.7	7,920
100 cows producing creep-fed calves	376	52	2700	263	1000	3.8	6,996
200 calves, wintering and grazing	400	100		93	1000	10.7	5,220

*Since wheat pasture is used in the wintering program, half of the rough feed normally considered necessary was used in preparing the feed budget.

Since this section is known as the feeder calf producing section, a good market can be obtained for feeder calves. Corn belt buyers, as well as buyers from other sections of the state, look to this area for good quality calves. The cow herds should continue to occupy a prominent place in the cattle program of this area, at least on the larger ranges. On the smaller ranches and farms, the deferred systems, using grain sorghums, can furnish a consistently large return. The development of summer fallow for sorghums and the practice of keeping over silage in a large trench silo from one season to the next can help to insure a supply of feed for drought years.

Area VI, Northwest and North Central

Included in Area VI are the following counties: Cheyenne, Rawlins, Decatur, Norton, Phillips, Smith, Osborne, Thomas, Sheridan, Graham, Rooks, Osborne, Mitchell, Cloud, Wallace, Logan, Gove, Trego, Ellis, Russell, Lincoln, Ottawa, Greeley, Wichita, Scott, Lane, Ness, Rush, Barton, Ellsworth, Saline, Hamilton, Kearny, Finney, Hodgeman, Pawnee, Stafford, Stanton, Grant, Haskell, Gray, Ford, Edwards, Morton, Stevens and Seward, also parts of Meade, Kiowa, Pratt, Dickinson, and Clay.

Soil types in Area VI vary from the wind blown soils of western and northwestern Kansas to the residual soils of Lincoln, Ottawa, and Ellsworth of Dakota Sandstone origin.

Wheat is the principal crop. With the exception of a few ranches, all types of farm organizations are based around the wheat enterprise. Beef

cattle numbers in this area are light. Hedges et al. (2) report that in land use planning area 11, which is the northwestern part of this area, the fewest beef cattle per thousand crop acres are found.

Grass is principally buffalo with mixtures of grama grasses, much the same as in Area V. Area V is rough land, and has, in great part, been left in grass. Area VI tends, on the average, to be much more level and has been broken up for crop land. The carrying capacity of the grass in Area VI is the same as for Area V, namely: Calves, five acres, cows, 10 acres, and yearlings, seven acres.

In addition to wheat, barley, milo, silage and a limited amount of alfalfa are produced. According to the Kansas State Board of Agriculture, the average yields in this area from 1911 to 1940 are as follows: Barley, 15.2 bushels; wheat, 10.5 bushels; grain sorghum, 12.7 bushels; silage, 6 tons; alfalfa, 2.2 tons; and corn, 11 bushels per acre.

Programs recommended:

1. Cow herds.
    a. Feeder calves.
    b. Creep-fed calves.
2. Wintering and selling in the spring (wheat pasture).
3. Wintering and summer grazing (good quality).
4. Deferred full feeding.
    a. Steer or heifer calves.
    b. Yearling steers.

5. Winter full feeding.

a. Good quality.

b. Plainer grades.

As was mentioned in Area V, the development of the combine sorghum industry in both of these areas will do much to develop sound cattle programs in western Kansas. Feeding experiments at the Hays Station have proved the value of grain sorghums as a cattle feed (1). Grain sorghums can be stored easily through the winter when the temperatures are low. Spring and summer temperatures cause them to heat. More work needs to be done with ventilated grain bins and with moisture studies at the time of harvesting in relation to the keeping quality of the grain. This promises in the future to point the way to a sorghum-belt cattle feeding program, that in many ways could equal or surpass the present corn-belt feeding program.

For wheat farms, having little or no grass, the winter full feeding program has been added in this area. This program has some advantages over a program based on wintering and selling in the spring.

The wintering program in this area usually depends on wheat pasture and is not dependable year after year as a cattle program. Growing grain sorghum in a rotation with wheat is a good agronomic practice. The use of grain sorghums in the winter full feeding of cattle gives for a greater diversity of income.

This area has a great need for a livestock program since, at present, it is almost a one crop area.

Fertility of crop land in this section of the state is high. Moisture is the limiting factor. Size of operation is large and the equipment is

selected for large scale wheat farming. This equipment fits into a combine sorghum grain feed program.

The deferred programs, as has been mentioned in other areas having wheat as the principal crop, fits into the labor management program. Other programs that also fit into the labor management program are wintering and winter full feeding. Cow herds, since they require attention throughout the year, do not.

The deferred programs are quite intensive, in that they bring in a large gross income or volume of business. In Areas V and VI, since most farms have large acreages, a large volume of business may not be required. In other words, the operator may be willing to operate one of the less intensive programs, such as the production of stocker and feeder calves or wintering and grazing, rather than assume the responsibility of managing the labor and capital involved in one of the deferred programs.

The wintering program in this section of the state is planned around wheat pasture. By the use of summer fallow and trench silos to produce and keep silage, this program could be developed into a program that could be practiced in any year.

Cow herds, in this section of the state as in any other, should be of the highest quality possible. It is never profitable to produce plain quality calves.

Creep-feeding would be profitable on the smaller cow herds. It could be based on the use of grain sorghums.

Alfalfa production is not possible on many farms in Area VI but should be produced wherever possible.

Table 8. Feed requirements, acres required to produce feed, grass crop land ratio, and return for rough feed and grass for beef programs in Area VI.

Program	Feed Budget: Silage tons	Alfalfa hay tons	Grain bushels	Acres to produce	Grass acreage	Grass crop land ratio	Return for rough feed and grass
100 cows producing stocker and feeder calves	375	50		85	1000	11.7	$ 3,600
150 yearlings, winter, sell in spring (good quality)	225*	75		80			2,913
150 yearlings, wintering and grazing (good quality)	450	150		159	1050	6.6	5,400
200 steer calves deferred	400	100	7000	612	1000	1.6	10,960
200 heifer calves deferred	400	100	4000	398	1000	2.5	7,920
100 cows producing creep-fed calves	376	52	2700	300	1000	3.3	6,596
150 plain yearlings winter full feeding	300	51	2250	233			4,869
150 good yearlings winter full feeding	150	27	6450	497			3,780

*Since wheat pasture is used in the wintering program, half of the rough feed normally considered necessary was used in preparing the feed budget.

ALTERNATIVE ENTERPRISES

In developing this study, the author has devoted his efforts to determining the factors that make one beef enterprise fit a certain farm better than another beef enterprise. It must be understood that other enterprises might fit the farm in question much better than a beef enterprise. It was mentioned in the discussion of Area II, that Area II is a dairy section. Western Kansas is a wheat section. Cash crops during the past 10 years have been profitable. This was due to favorable prices and continued high yields.

Farm Management summaries were used in an endeavor to find the comparative income between the beef enterprises and other enterprises. In Kansas, four Farm Management Associations are in operation. These associations cover most of Kansas, except northeast Kansas and the extreme southeastern part of the state. Summaries were available starting in 1937. The records for 1938 to 1947 were used for a ten-year study. The beef enterprise and the cash crop enterprise were compared in this study. A similar study might be made with the sheep, swine, or dairy enterprises. Cash crops were used since they have been profitable, and also, because in many sections of the state the choice must be made between cash crop farming and livestock farming, or between a combination of the two. In making this study, farms that received 40 per cent or more of their income from cash crops were considered as cash crop farms. Farms that received 40 per cent or more from beef were considered as beef farms. This exact division was not possible in a few years. Farms, showing the major part of their income from beef, were used and classified

as livestock farms. It must also be remembered that even on farms classified as beef farms, a large part of the income may have been derived from a cash crop. This is particularly true in western Kansas.

The figures in Table 9 indicate that in all sections of the state, except northeast Kansas, incomes have been higher on beef farms than on cash crop farms. Also, that incomes from beef have been consistently higher than from cash crops.

Three measures of size of business were studied in an effort to establish the fact that it was the beef enterprise which caused the beef farms to have consistently higher incomes than the cash crop farms. These measures were: Total acres, crop acres, and number of men employed. From the standpoint of the total acres, beef farms were consistently larger. This finding is logical since larger grass acreages would be employed. Total crop acres, another measure of size of business, were larger in each section on the cash crop farms. No significant difference was found in the number of men employed. This would indicate that since beef farms were larger in one factor, cash crop farms larger in a second, and no difference in a third, size of business was similar.

One might also content that during the years included in this study, beef prices were higher in relation to other prices than was wheat. Using 1935 to 1939 as a base period and using the Kansas farm price from Crops and Markets, it is found that in the base period wheat averaged .85, that during the period, included in Table 9, the average farm price was $1.22. Thus, in the period studied the wheat price was 144 per cent of the 1935-39 base.

Table 9. Ten-year comparison between beef farms and cash crop farms taken from Farm Management Association summaries, 1938 to 1947, inclusive.

Section	Average net income	Years each enterprise held	Total acres	Tons acres	Number of men
North Central					
Beef	$3767	6	644	284	1.8
Cash crop	3766	4	596	338	1.8
North East					
Beef	3876	5	488	225	2.1
Cash crop	4289	5	400	266	2.1
South Central					
Beef	5221	8	528	334	2.2
Cash crop	4737	2	485	383	2.0
South West					
Beef	8084	7	1673	516	2.0
Cash crop	7268	3	982	703	2.0

Comparing cattle prices during that same period, again using Kansas farm price from Crops and Markets, we find that the 1935-1939 base was $7.14. The average cattle price for the period included in the table referred to above was $11.63, or 163 per cent of the base period. Thus, it would seem that in the period studied, cattle prices had advanced nearly 30 per cent more than wheat prices.

However, in such an analysis one must also take into consideration that price is not the whole story, and that in the case of wheat the matter of yield is just as important as is price. Using the south central section as a check on this factor and using Kansas State Board of Agriculture yields for the period 1911-1940, we find that on the basis of seeded acres the average yield was 12.7 bushels per acre. For the period 1936-1947 on the seeded acre basis, this section of the state averaged 14.4 bushels per acre, or 113.4 per cent of the base period.

Thus, it would seem that while beef prices had increased in the period studied more than wheat prices that this increase in price in favor of beef could largely be off-set by an increase yield in the case of wheat.

It must also be pointed out that farm management studies, while helpful, are not a true measure of income since most farms in farm management associations are larger than the average farms in the areas represented. In certain sections of the state, farm management associations may have a larger per cent of their members handling livestock than the average of the farms in the area represented. Manuel (4) points out that in Area 6b (South Central Kansas) farms in the Association grossed $12,924, while average farms in that type of farming area grossed $7,277.

The author wishes to again emphasize that the high average net income of the farms in the farm management studies was the result of a combination of enterprises. For instance, some farms in area 6 that were classified as beef farms received as much as 35 per cent of their income from wheat.

In addition to a higher net income from farms that have an efficient livestock program, there is a saving in soil fertility. Miller and Tuck (5) point out that when a cash crop is produced, 100 per cent of the fertility that goes into raising the crop is sold from the farm; but when livestock is handled and an ordinary job of handling the manure is done, 40 per cent of the nitrogen, 50 per cent of the phosphorus, and 45 per cent of the potassium is returned to the soil.

FEED GRAINS

With the exception of producing stocker and feeder calves, wintering, wintering and summering, all of the beef programs recommended for Kansas require grain feeding. In [illegible] up crop land grass ratios, it was assumed that most of the feed grain would be produced on the farm. However, it was pointed out that if a stockman wished to increase his net income from his beef enterprise he could do so by engaging in a more intensive enterprise and using his crop land to produce rough feed. This would necessitate his purchasing all or part of his feed grain. Therefore, a study of the feed grain situation in Kansas must be a part of any study of beef systems.

Jaccard et al. (3) in "A Postwar Pattern of Production for Kansas Agriculture" showed that in 1943-1944, 4,192,000 tons of feed grains (corn equivalent) were available for feeding livestock, of which 3,527,000 were needed to feed livestock in the state. Yet Kansas has been known as a state which generally is on a ship-in basis as far as feed grains are concerned. This is due to heavy out-shipments of grain following harvest. The following spring it is necessary to ship a portion of that grain back in for livestock feed. A study of corn and sorghum prices over a 20-year period shows that the low occurs in November and December soon after the crop has been harvested, and that the high occurs in May or June the following summer.

Thus, it would seem that one of the advantages in establishing a beef enterprise on a farm and in planning its feed requirements would be to enable the operator to purchase the required feed at the seasonal low.

A SYSTEM SHOULD BE PERMANENT

Once the correct beef system is established for a farm, it should be operated year in and year out. The operator should buy either feed or replacement cattle without too much regard for what they cost as long as he pays the going price. In many cases replacement cattle appeared high in the fall, and this had a tendency to discourage purchases; thus, preventing normal operations in some of the most profitable years.

The cattle price in the deferred system, once an operator has his program in operation, is not too important. When cattle prices are on a high level

in the fall, the farmer sells his fat cattle to an [illegible] but in turn pays high prices for his replacement calves. When the cattle price is low in the fall, the operator may not make a very large profit on the full feeding operation but in turn is able to buy replacement calves to an advantage. One might compare the market fluctuation in a program of this kind to the market fluctuation in a wheat operation in which the operator insures against violent price changes by "hedging".

To illustrate this principle, the Bureau of Agricultural Economics figures were used for the Kansas City market for the month of November in the following years:

Table 10. Average prices for the month of November at Kansas City, Missouri, 1928 to 1934, Bureau of Agricultural Economics.

Year	Good to choice stocker calves	Good slaughter yearlings	Choice slaughter yearlings
1928	13.35	15.00	17.05
1929	12.35	13.95	15.20
1930	10.15	12.35	13.45
1931	7.45	10.50	11.50
1932	6.50	6.60	7.60
1933	5.30	5.50	5.95
1934	5.30	7.65	8.50

During this period of years, the beef price was declining each year. Fortunes were lost largely because stockmen would not stay on a system that called for selling at a regular time and purchasing back on the same market. To illustrate this in this period of years on the deferred system, if the operator could have purchased choice calves and sold them a year later as choice yearlings, in 1931 the yearlings he sold that year for $11.50 had cost $10.15, leaving a normal margin. In only one year, 1933, he would have sold yearlings for less than he paid for them, and then only receiving .55 per hundred less than they cost. Keeping in mind that this gain is put on with rough feed, pasture, and not too much grain, one would assume that even in that year he "broke even".

In the period when prices are on the incline, large profits can be made. Table 11, illustrates this.

DEVELOPMENT FOR THE FUTURE

A study of systems adapted to different areas within the state has much to commend it. Already certain areas have gained a place for themselves on the markets. Southwestern Kansas has won national recognition as an area for the production of stocker and feeder calves. The Whitewater area in Butler County has established itself as an area producing deferred fed calves. The Gridley community in Coffey County has forged ahead in the production of deferred fed yearlings.

Colonel E. N. Wentworth of Armour and Company points the way with this prophesy, "I believe that the next great development in the beef industry will be the establishing of certain beef programs to fit specific areas."

Table 11. Average prices for the month of November at Kansas City, Missouri, 1927 to 1947, Bureau of Agricultural Economics.

Year	Prices		
	Good to choice stocker calves	Good slaughter yearlings	Choice slaughter yearlings
1937	8.70	12.20	14.65
1938	9.70	10.25	11.75
1939	11.00	10.30	11.20
1940	12.00	12.25	13.60
1941	13.15	11.55	12.55
1942	15.15	15.35	16.45
1943	13.20	14.45	15.85
1944	14.25	15.60	17.45
1945	15.25	16.80	17.65
1946	16.35	26.85	31.21
1947	24.65	30.05	34.15

Taking one of the extreme years, cattle which cost $15.25 per cwt. sold in the fall of 1946 for $31.21. In other words, they doubled their value per hundred.

SUMMARY

Kansas has a wide variety of conditions. This fact makes a number of beef production systems necessary, if Kansas operators are to capitalize to the fullest extent on their natural resources. No one system of beef production can best fit the needs of stockmen in all sections.

The State of Kansas has been divided into six beef production areas so that Kansas stockmen might have a guide to profitable systems in their respective section. These areas include counties which are similar in grass land, crop land, topography, also of farm and beef systems now in operation. The beef production areas are: Area I, Northeast corn belt; Area II, Southeastern Kansas; Area III, Flint Hills; Area IV, South central Kansas; Area V, Southwestern Kansas; Area VI, North central and Northwestern Kansas.

There is a wide range of conditions between farms in each area. It is, therefore, impossible to recommend one system of beef production for each area. As a result, several systems have been recommended for each area by Dr. A. D. Weber and Associate Professor A. G. Pickett, of the Animal Husbandry Department, and the author.

This study lists the factors which makes one of these programs fit a specific farm better than another program. Heretofore, unassembled material has been put together in this work to enable a stockman to select the best beef system for his farm. A system can be selected from the list recommended for his area, and it should fit the physical characteristics of his farm.

Many factors were considered in establishing the method used to calculate the returns expected from a beef system. The years 1922-1941 were used as

base years for prices in this study. Gains and rations fed were based on experimental material at Kansas State College. For each system a return was calculated, which was expressed as the return the stockman would receive for his rough feed and grass. Returns for rough feed and grass were used instead of net returns. The purpose of a livestock system to the farm organization plan is to make a market for non-saleable rough feed and grass.

The deferred systems of beef production proved to be the most intensive systems. For a given acreage and a given amount of capital, more returns can be made using these systems than any other system. They are adapted to each beef production area. Many farms in each area, not now using those systems, should be using them.

Winter full feeding of good quality cattle, during the years used as a base period in this study, (1922 to 1941, Kansas City Daily Drovers Telegram), was less profitable than the winter feeding of plain steers.

Production of stocker and feeder calves should be limited to the western one-third of the state and to large ranches. Elsewhere in Kansas, cow herd owners should creep feed their calves.

Wintering and selling in the spring offers large returns when wheat pasture is available. For farms in the west, sorghum silage can be used in years when wheat pasture is not available. This enables that section to have a livestock system each year regardless of wheat pasture.

Buying cattle in the spring for grazing, is a speculative system. Therefore, leasing of pastures is recommended, where grass acreages are so large that more cattle can be grazed than can be wintered.

The amount of crop land necessary to raise the feed required by each system was worked out, in addition to listing the factors in each area that influence the use of one system in preference to another. The necessary grass acreage was combined with the crop land to make a grass crop land ratio in systems requiring the use of grass. Yields, used in arriving at the acres of crop land needed, were secured from reports of the Kansas State Board of Agriculture. Carrying capacities of grass for the various areas have not been established in any previous study, so the carrying capacities used represent experience of the author with cattlemen in different areas.

The development of an area to the extent that a large number of stockmen are practicing a similar beef system will result in the creation of a reputation for that area. It should result in a slight market premium for their product.

Beef production is more profitable over a period of years than one crop farming according to the summary of the four Farm Management Associations in the state for the 10-year period, 1938-1947. Not only does livestock farming bring in greater returns, but, in addition, it conserves the fertility of the soil.

ACKNOWLEDGMENTS

The writer is indebted to Dr. J. A. Hodges, his major instructor, for his assistance, valuable suggestions, and criticism of the method and presentation of the data. Credit is due C. Peairs Wilson of the Department of Economics and Sociology for his assistance in organizing the material presented and to A. G. Pickett of the Department of Animal Husbandry for his assistance in preparing feed requirements for the various beef systems.

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